

5-1980

## Ash Hollow Historical Park

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Diffendal, Robert Jr., "Ash Hollow Historical Park" (1980). *Robert F. Diffendal, Jr., Publications*. 60.  
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# ROCKS & MINERALS

MAY/JUNE 1980

VOLUME 55 NUMBER 3

\$2.00

Official Show Issue  
**American Federation**  
Lincoln, Nebraska



**Nebraska!**





# Ash Hollow Historical Park

Rock exposures, east side of Ash Hollow Creek at the mouth of the valley. The Brule Formation is exposed in the lower half of the photo. The Ash Hollow beds overlie the Brule.

*The Ash Hollow State Historical Park, administered by the Nebraska Game and Parks Commission, is located at the mouth of Ash Hollow Creek in southeastern Garden County. It occupies 1,001 acres and has a camping area with picnic tables, drinking water, fireplaces, hiking trails, and sanitary facilities. The park offers an opportunity to study early man and the Tertiary and Quaternary geology of the state.*

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Ash Hollow Creek is an intermittent stream forming a southern tributary to the North Platte River. The creek flows only in response to precipitation from locally heavy thunderstorms or to heavy runoff from melting snow in the spring. Western Nebraska has a semi-arid climate and receives less than 20 inches of rainfall per year.

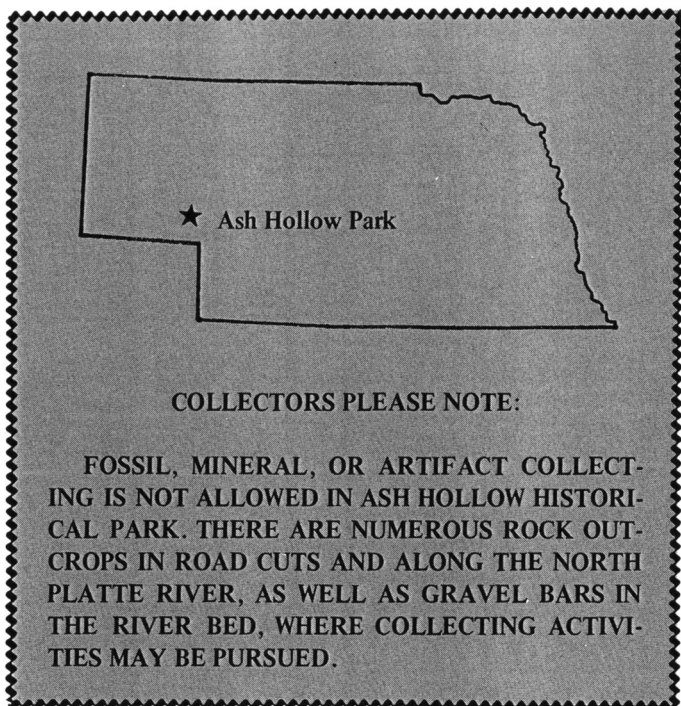
Vegetation in the park and surrounding area is typical of the short grass prairie of the Great Plains. Native short grasses grow

abundantly on undisturbed tablelands, valley sides, and along principal flood plains of streams and rivers. Prickly pear, barrel cactus, yucca and sagebrush are common but are more abundant in areas underlain by sand or sand and gravel. The dominant tree in the park area is the mountain cedar. The trees on the floor of Ash Hollow Creek valley include white ash, hackberry, and cottonwood, while cottonwood and willow are dominant along the channel of the North Platte.

There is a tremendous variety of animal life in the park; small mammals, many varieties of birds, and reptiles are well represented in the area. Fishing in the North Platte and in nearby lakes and reservoirs is often excellent.

Ash Hollow has a long history of human occupation. Ameri-





can Indians roamed the park area for thousands of years before the arrival of European, African, and Asian settlers. Animal kill sites, camp sites, and shelters reveal that the valley was the home of several distinct cultures of Indians during this period.

After the first European and American explorers worked their way along the North Platte, a flow of settlers moved along the Platte River following the Oregon trail and often crossed the divide between the South and North Platte Rivers at Ash Hollow. While the terrain is rugged in the park area, the valley of Ash Hollow Creek was one of the few spots along the North Platte within a day's travel of the South Platte where wagons could descend to the valley floor with relative safety and where water and shelter were available to travelers and their animals. Along most of the remainder of the south side of the North Platte nearly vertical escarpments of as much as 100 feet made wagon descent virtually impossible.

Today a modern highway allows a traveler to make the journey between the two rivers in a few minutes instead of a long, difficult, day-long wagon trip. The valley of Ash Hollow Creek now has an improved campground offering shelter and rest to visitors.

### General Geology

It is always difficult to convey the richness of the human and geologic history of Ash Hollow in a relatively few words. Many people looking for the scenery of the national parks or even of Scottsbluff National Monument to the west only see Ash Hollow from a rapidly moving automobile. But a closer study reveals a part of the interesting saga of Great Plains geologic development.

The oldest rocks in the park are exposed along the valley sides at and near the mouth of Ash Hollow Creek. These light

brown siltstones belong to the Brule Formation of Oligocene age and have been dated at about 30 million years. The siltstones are poorly consolidated, vertically jointed, and weathered and eroded to form nearly vertical slopes. To the untrained eye the rocks of the Brule Formation look uniform in appearance, but a closer inspection reveals that in some places there are darker horizontal zones in the formation representing periodic soil development during times when sediment deposition had ceased or slowed appreciably. Near the top of the formation, scattered, hard, lime-cemented nodules occur in zones, probably close to where the former water table of the area was located after Brule deposition.

The rather uniform, fine-grained, and unstratified nature of the Brule siltstone is interpreted by most geologists to indicate deposition of material by wind. Recent studies have produced another unexpected conclusion. Most of the silt grains in the Brule are composed of either volcanic ash (glass) shards or crystals coated with glass. These glass shards and crystals were blown high into the atmosphere during gigantic explosive volcanic eruptions in the Rocky Mountains or Great Basin. The fact that a blanket of volcanic material up to 600 feet thick covers much of western Nebraska is difficult to comprehend. Imagine the magnitude of the eruptions necessary to produce a layer just a few feet thick covering much of the northern Great Plains and the tremendous dust clouds that swept across the plains after these eruptions! The dust bowl days of the 1930s would be insignificant by comparison.

The Brule Formation yields few fossils in the park area. Vertebrate fossils from the Brule include teeth and bones from rhinos and oreodonts (extinct mammals similar in size and life habits to sheep). A few limy pond deposits have yielded snails and ostracods (crustaceans with bean-shaped, bivalved shells).

The next younger deposits at Ash Hollow Park belong to the Ash Hollow Formation of Miocene age. These deposits have been radiometrically dated at 6 to 10 million years old by Boellstorff (1978). The 20-million-year gap between the youngest Brule and the oldest Ash Hollow beds is represented by an erosion surface called an unconformity. It is not known whether beds younger than the Brule and representing part of the missing 20-million-year record were deposited and later eroded or not. But we do know that the thick, basal Ash Hollow conglomerate is composed almost entirely of eroded concretions from the Brule, so it is unlikely that a thick formation of intermediate age was ever deposited in the area.

The Ash Hollow beds, in contrast to the underlying Brule, display a diverse sequence of rocks that vary greatly both vertically and laterally. They include claystones, siltstones, orthoclase-rich sandstones, granitic conglomerates, lithic conglomerates, pebbly sandstones, limestones, diatomaceous

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marls, volcanic ash beds, and their unconsolidated equivalents. Many of these rock layers show definite stream channel geometries and were deposited in streams or oxbow lakes bordering streams. The pebbly sandstones may represent mudflow or slope deposits.

Because the slope of the stream deposits is not much greater than the slope of the Great Plains surface today, the streams that drained the area in Ash Hollow time were probably sluggish and intermittent. The geometry of the entire formation and the relationship of laterally equivalent layers to one another indicates that elevation differences on the surface of the deposits in any one place during an instant in geologic

time were very small and the surface was very flat.

Up to five volcanic ash layers have been found in superposition in the park area. These ash deposits are sandwiched between layers of stream deposited sediments up to tens of feet thick. The ash beds are as much as twenty feet thick and are very pure indicating the ash fell directly from the air. In some places, small, concentrically layered ash pellets have been found that have been interpreted as "fossil hailstones" by some geologists.

Fossils are far more common in the Ash Hollow beds than in the Brule. These fossils include casts of roots, seed husks and coats from grasses and trees, shells of snails, clams, and

#### Fossils from the vicinity of Ash Hollow Park.

**Brule Formation** — 5. Oreodont left upper molars; 10. Beaver (*Paleocastor*?) mandible. x1.5.

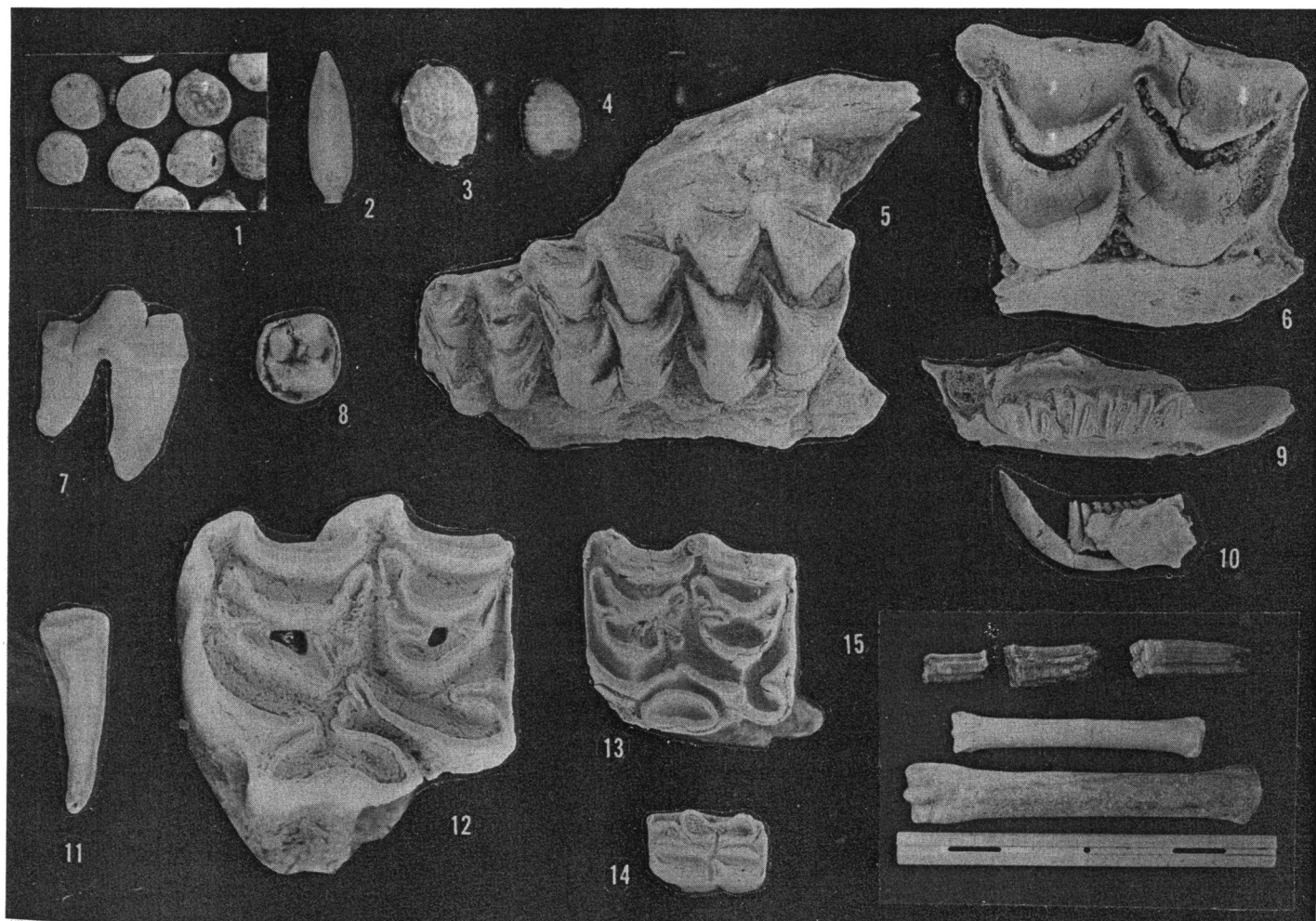
**Ash Hollow Formation — Seeds** — 1. Hackberry (*Celtis*), x2; 2. Grass (*Stipidium*), x5; 3. Shrub (*Biorbia*), x5.

**Vertebrates** — 6. Camel (*Oxydactylus*?) molar, x1.5; 7. "Dog" (*Borophagus*?) molar, x.75; 9. Beaver (*Dipoides*) mandible, x1.5; 11. Horse incisor, x1; 13. Horse (*Neohipparion*?) upper molar, x1.5; 14. Horse (*Neohipparion*?) lower molar, x1.5.

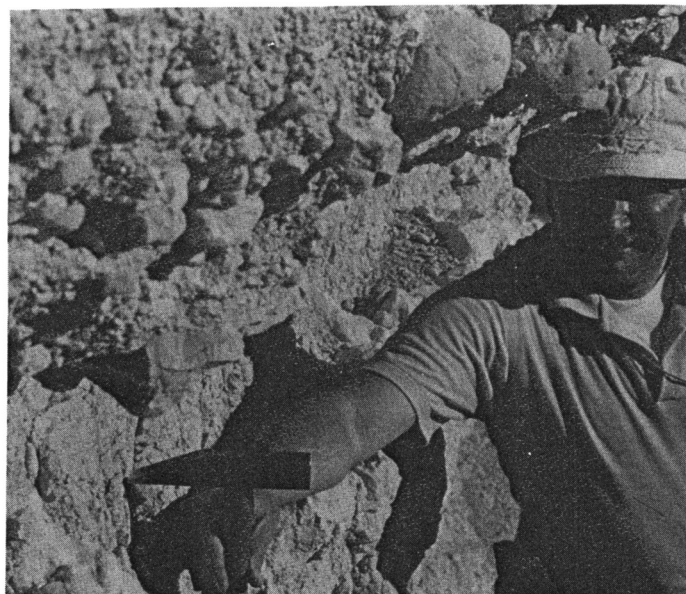
**Pleistocene and Recent Formations — Alga** — 4. *Chara*, x6.

**Vertebrates** — 8. Tapir (*Tapirus*) premolar, x1; 12. Horse (*Equus*) molar, x1.5.

15. Comparison of size of *Neohipparion*? (smaller) and (larger) teeth and limb bones.







**Left:** The three darker zones are old soils developed within the Brule. **Right:** The Ogallala-Brule contact is shown above the author's hammer and hat brim.

ostracods, and teeth and bones from a diverse mammalian fauna, including beavers, oreodonts, camels, antilocaprids, horses, rhinos, mastodons, and "dogs." Shells of land turtles as large as washtubs are sometimes found. Since all these fossils have modern representatives living in environments typified by the semi-arid plains climate of today, it can be concluded the fossil forms probably lived in similar environments.

The next youngest deposits at the park are light tan silts called loess which are interpreted as wind deposits. These silts are probably part of the Peorian loess of Pleistocene age dated by Schultz and Hillerud (1978) as about 10,000 to 80,000 years old. The loess rests unconformably on top of the Ash Hollow beds and drapes over much of the terrain like a blanket. The

most common fossils in the loess are land snails, root casts, and bison bones and teeth.

The youngest strata at the park are slope debris, stream terrace, and flood plain deposits. According to Schultz and Hillerud (1978) these sediments range in age from 10,000 years before present to debris being transported today. Most of the Indian artifacts, bison kill sites, and village sites are found in this material.

The geological history of Ash Hollow State Historical Park is, of course, much more detailed than this brief sketch indicates. As indicated in the reference list, there is a considerable amount of geological and paleontological literature that will lead you to an understanding of the area's interesting geology.

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